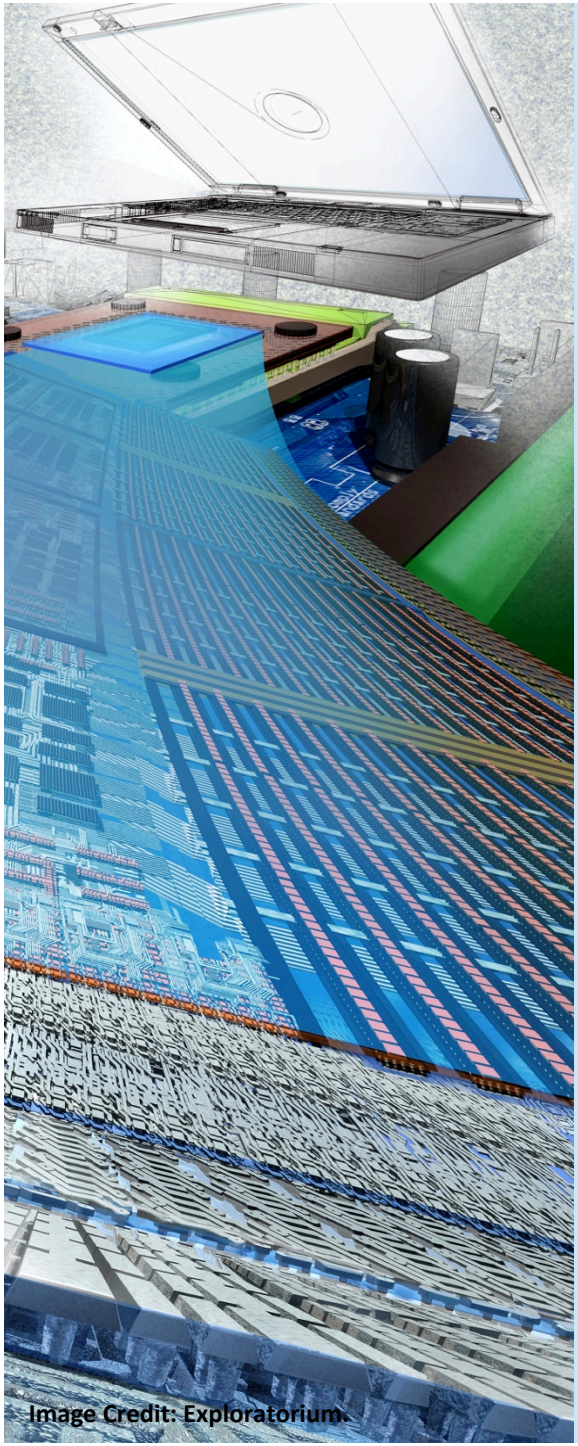


CISE Overview and Update

Farnam Jahanian, AD
Suzi Iacono, DAD

CISE AC Meeting
January 14, 2014

Overview

- CISE DD Searches
- Budget Update
- Program Updates
- Activities Updates

CISE DD Search Committees

CCF Division

- **Co-chairs:**
  - Sarita Adve, UIUC
  - Salil Vadhan, Harvard U
- **Members:**
  - Michelle Effros, Cal Tech
  - Mary Jane Irwin, PSU
  - Christos Papadimitriou, UC Berkeley
  - Moshe Vardi, Rice U
- **NSF liaison:**
  - Debbie Lockhart, DDD/IIS

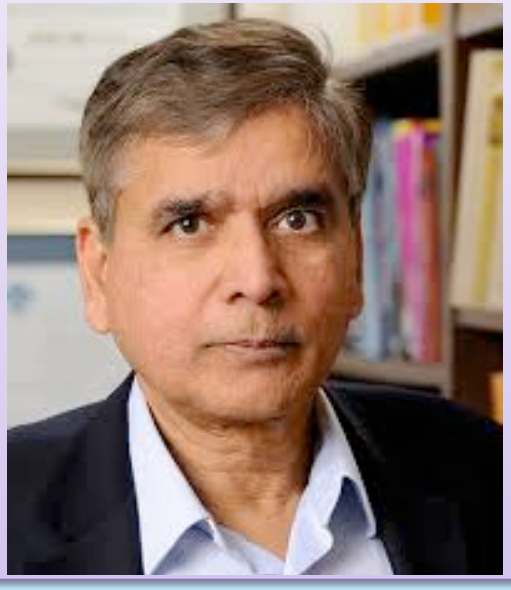
ACI Division

- **Co-chairs:**
  - Jim Bottum, Clemson U
  - Katherine Yelick, Lawrence Berkeley National Laboratory
- **Members:**
  - Fran Berman, RPI
  - Sharon Glotzer, U MI
  - Bill Gropp, UIUC
  - David Lifka, Cornell U
- **NSF liaison:**
  - Keith Marzullo, DD/CNS

CISE DD Search Update

CCF Division

Welcome Rao Kosaraju!



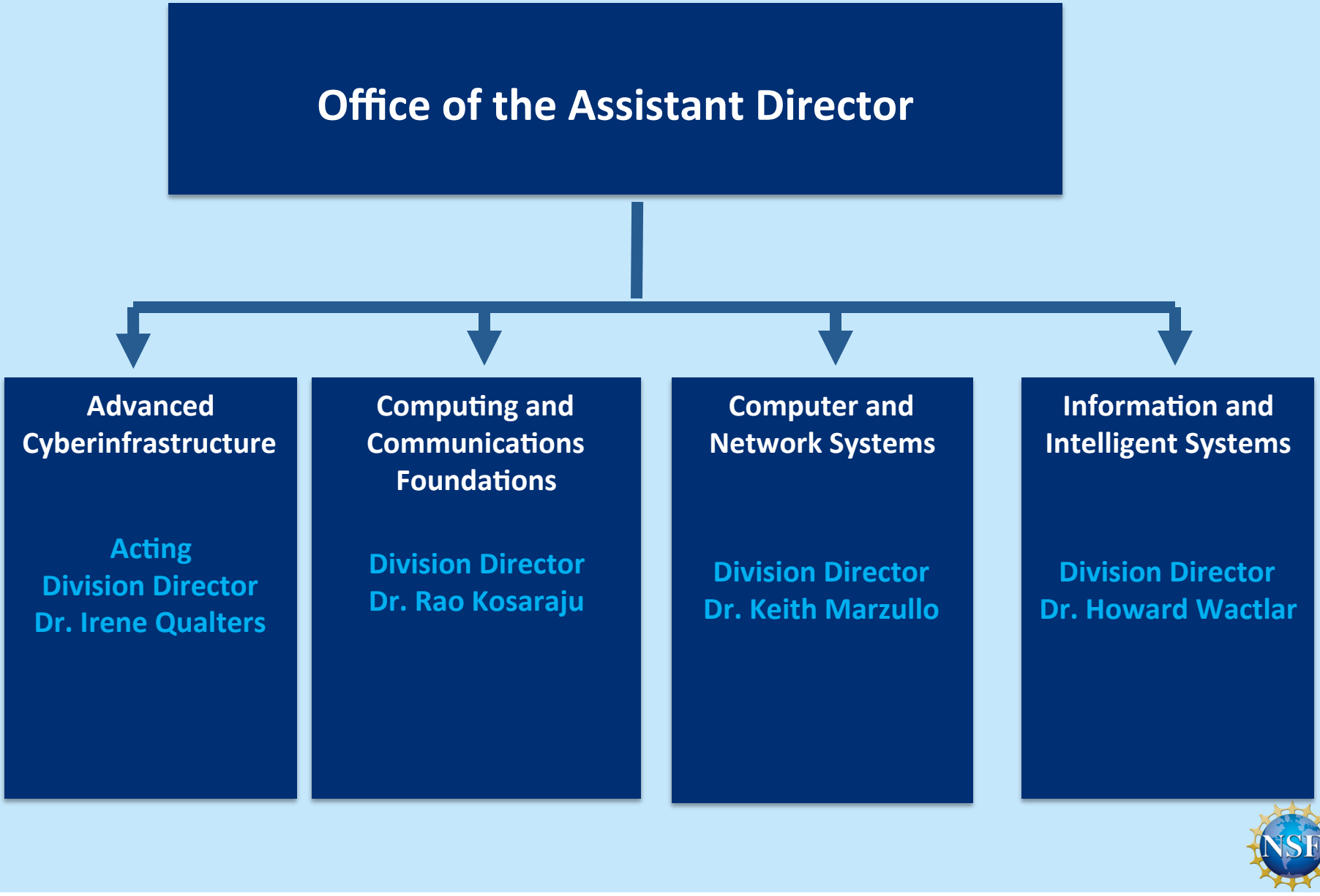
ACI Division

Acting DD Irene Qualters

Two new division director searches to be launched this year:

- Volunteers to serve on search committees
- Suggestions for potential candidates

CISE Organization



NSF Director Nominated

France Córdova nominated by President Obama, awaiting Senate confirmation


Budget Update

Budget from FY 2010 – 2014*

	FY 2010 Actual ($M)	FY 2011 Actual ($M)	FY 2012 Actual ($M)	FY 2013 Current Plan ($M)	FY 2014 Request ($M)
CISE Total	**$618.71**	**$636.06**	**$653.32**	**$858.53**	**$950.25**
R&RA Total	$5,615.33	$5,608.38	$5,758.30	$5,543.72	$6,212.29
NSF Total	$6,972.20	$6,912.55	$7,105.41	$6,884.11	$7,625.78

* FY 2013 and FY 2014 Include ACI Division.

FY 2014 Appropriations: Priorities Endorsed

- **Omnibus Appropriations Bill**
  - Released Jan. 13, vote pending
  - To provide NSF with $7.172 B
    - 4.2% increase over FY13 current operational plan
    - 6% below the FY14 President's Request

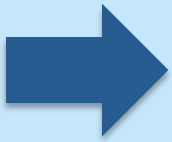
- **Both Bills:**
  - Closely align with NSF's funding priorities.

- **House Report:**
  - Cognitive Science and Neuroscience; and
  - Advanced Manufacturing related research.

- **Senate Report:**
  - Cybersecurity;
  - Science, Engineering and Education for Sustainability (SEES);
  - Strong support for Core Research; and
  - Facility operations and maintenance.

Snapshot of CISE FY 2013 Activities

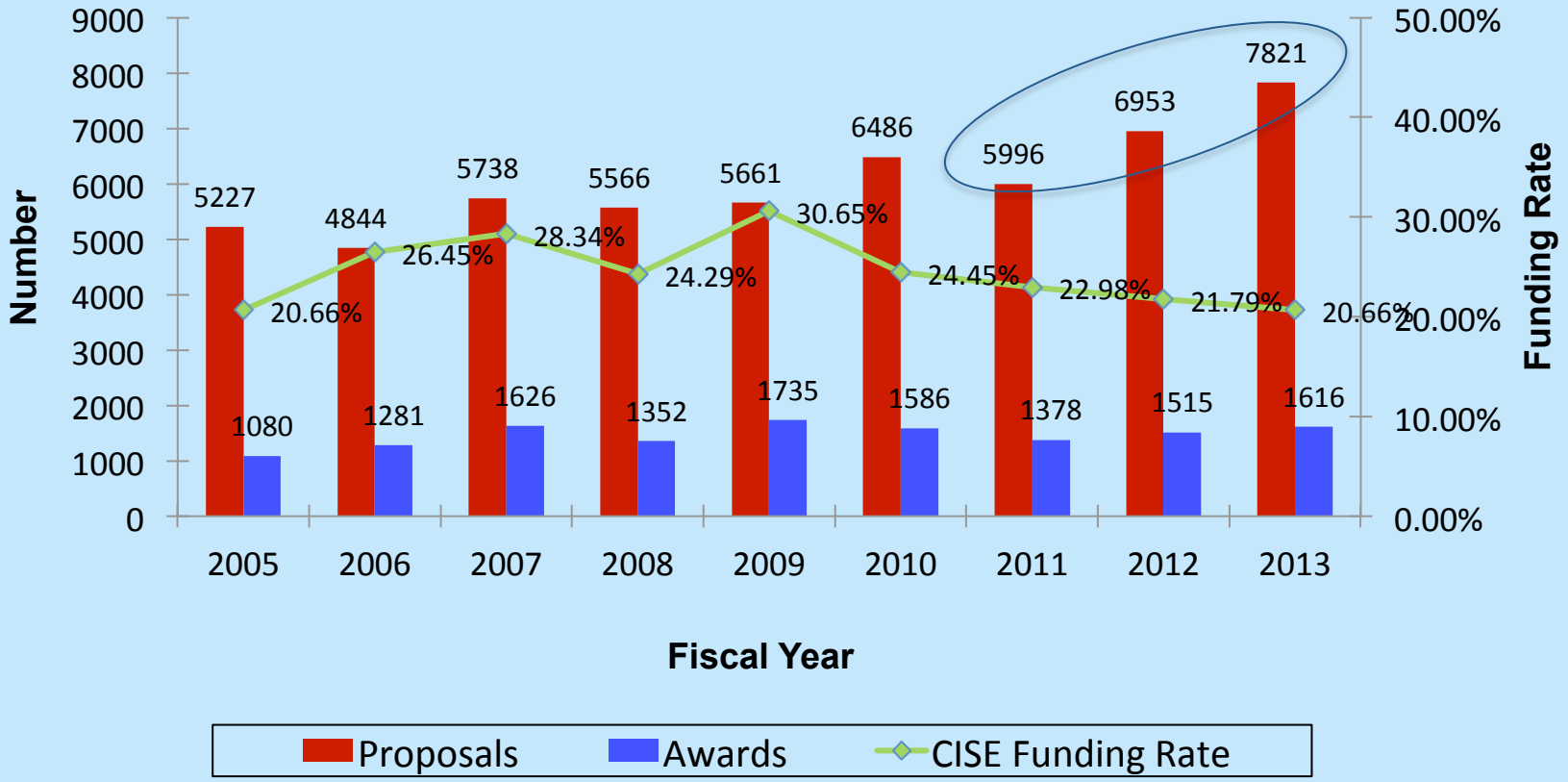
	FY 2013
Research Budget	$858M
Number of Proposals	7,821
Number of Awards	1,616
Success Rate	~21%
Number of Panels Held	344
Virtual Panels Held	79
Number of People Supported	17,227



People Supported	#
Senior Researchers	6,652
Other Professionals	1,186
Postdoctoral Associates	475
Graduate Students	6,609
Undergraduate Students	2,305

Includes ACI activities

CISE Workload and Funding Rate



FY 2013 Includes ACI

Discussion Item: CISE portfolio balance

How do we continue to build a meaningful portfolio, funding the right science at the right scale?

- *Assuming relatively "flat" budget outlook*
  - *Core vs. Multi-disciplinary Debate*
- *Foundational vs. Translational Research Debate*


Recent Lapse in
Appropriations
AKA the Shutdown

Three Stages, Really

Pre-shutdown (Sept. 18 – noon, Oct. 1)	The 16-day furlough (Oct. 1-16)	Post-shutdown (Oct. 17 – now)
*Preparing for an **orderly** shutdown*	*Nonessential staff cannot work*	*Resuming operations*
• Discussions with staff • FAQs • Emails with instructions • Determination of who is or is not "essential" • Contingency plans established for panels, travel, and meetings • Furlough letters arrive for each staff member from DD of HRM	• NSF website down • No proposals can be submitted • No new solicitations • Can't use government email • No travel • No budget close-out for FY13; no budget uptake for FY14 • No one can attend meetings: – Grace Hopper – CASC – Data2Action – Cybersecurity Summit – NRI PI meeting	• NSF Acting Director Cora Marrett held meetings with all NSF staff • No panels for two weeks following resumption • Postpone meetings as possible, including fall/ winter AC meeting • New deadlines set for solicitations with due dates during the shutdown • Reschedule panels, workshops, events • Website with notices: http://www.nsf.gov/bfa/dias/policy/postshutdown.jsp

Back in Business!

- Since the resumption of operations at NSF:
  - **17 CISE panels** that were scheduled to occur during the lapse (and two weeks after) have been rescheduled
  - **5 revised proposal due dates** have passed for the solicitations that were to receive proposals during the lapse
    - *New deadlines established for all five*
  - In clearance:
    - **20 solicitations**
    - **2 DCLS**
    - **8 MOUs**

Solicitations Posted and Work-in-Progress

- Big Data (work in progress)
- CAREER (NSF 14-532)
- Campus Cyberinfrastructure – Infrastructure, Innovation and Engineering Program, CC*IIE (NSF 14-521)
- Collaborative Research in Computational Neuroscience (NSF 14-504)
- Cyberlearning and Future Learning Technologies (NSF 14-526)
- Cyber-Physical Systems, CPS (pending)
- CyberSEES (NSF 14-531)
- Data Infrastructure Building Blocks (NSF 14-530)
- EARS (NSF 14-529)
- Expeditions in Computing (NSF 14-519)
- Exploiting Parallelism and Scalability, XPS (NSF 14-516)
- HPC Acquisition (pending)
- International Research Network Connections, IRNC (pending)
- National Robotics Initiative (NSF 14-500)
- Petascale Computing Resource Allocations, PRAC (NSF 14-518)
- Resilient Interdependent Infrastructure Processes and Systems, RIIPS (NSF 14-524)
- Secure and Trustworthy Cyberspace: Secure, Trustworthy, Assured and Resilient Semiconductors and Systems – SaTC: STARSS (NSF 14-528)
- Software Infrastructure for Sustained Innovation – SSE & SSI (NSF 14-520)
- STEM-C Partnerships: Computing Education for the 21st Century, CE21 (NSF 14-523)
- US-Finland Wireless Innovation (work in progress)

Program Updates

Cyberlearning

BRAIN

NSF Cloud & FIA

XPS

Expeditions & Frontiers

Technology promises to revolutionize learning.

- New and emerging technologies can expand and transform learning opportunities, learning interests, and learning outcomes for every phase of life.

- Technologies have a built-in capacity for the collection of data related to learning; these data present an enormous opportunity to increase our understanding of learning.

- NSF has the scope, the interest and the resources to advance our fundamental understanding of how people learn with technology, for the benefit of all.

Cyberlearning and Future Learning Technologies

Improving learning by integrating emerging technologies with knowledge from research about how people learn

Advancement of "science of learning with technology" – a systematic, inter-disciplinary body of knowledge on how people learn in technology rich environments and how to design, implement and effectively used technology to support learning and assessment.

Thrusts:

- Innovation of next-generation genres of learning technologies
- Advancing understanding of how people learn in technology-rich learning environments
- Promoting broad use and transferability of new genres

Cross-directorate program: CISE, EHR, SBE, ENG

Cognitive Science and Neuroscience

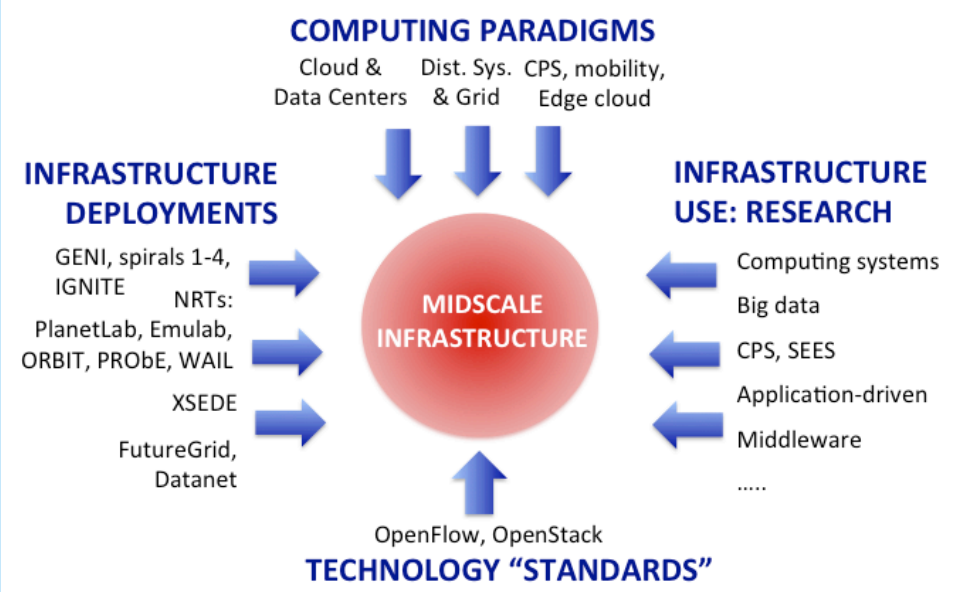
- White House BRAIN Initiative launched in April 2013 (NSF, NIH, DARPA).
- Addresses critical challenge of research integration across multiple scales ranging from molecular to the behavioral with the ultimate goal of understanding the human brain.
- Builds on ongoing NSF investments (e.g., Collaborative Research in Computational Neuroscience (CRCNS) in collaboration with NIH, Germany and France; Robust Intelligence Core Research).
- Catalyzed conversations among diverse scientific communities to prioritize research areas related to the BRAIN Initiative.

- **Multiscale & Multimodal Modeling** to relate dynamic brain activity to behavior
- **Comparative Analyses Across Species** to identify conserved functional circuitry: take advantage of Biodiversity
- **Innovative Technologies** to understand brain function and treat brain disorders
- **Cyber Tools & Standards** for data acquisition, analysis and integration
- **Quantitative & Predictive Theories** of brain function

CISE Research Infrastructure: Mid-Scale Infrastructure - NSFCloud

Enabling novel cloud architectures

- Objective: To support research **infrastructure that enables the academic research community to develop and experiment with novel cloud architectures and applications**



- Build upon existing investments, recent growth in cloud computing

Integrates key input from CISE AC subcommittee and CCC whitepapers

- Enable exploration of:
  - Resource sharing in clustered computing
  - Virtualization with software-defined networking technologies
  - Interplay between application and cloud computing architectures

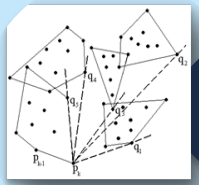
Future of Internet Architectures – Next Phase (FIA-NP) Update

- Four Future Internet Architecture (FIA) projects were funded in 2010
- FIA-NP aims to **leverage and enhance these FIA designs**
- **Move from design with integrated working code to proof of concept at reasonable scale**
- **Create and demonstrate prototype systems that will be tested and evaluated in one or more relevant environments**
- Proposals were submitted in June, and a panel meeting was held in August; currently processing award recommendations

Exploiting Parallelism and Scalability (XPS)

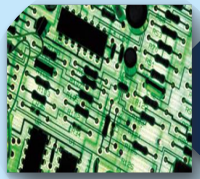
Support groundbreaking research that will lead to a new era of parallel computing

- Goal is to establish *new* collaborations combining expertise cutting across abstraction, software, hardware layers.
- Each proposal must have two or more PIs providing different and distinct expertise.
- Invest in foundational research advancing parallel and scalable computing, challenging validity of traditional computer hardware and software stack for heterogeneous parallel systems.
- Focus on new principles and cross-layer approaches that integrate both software and hardware through new programming languages, models, algorithms, compilers, runtime systems, and architectures.



Foundational Principles

- New models guiding parallel algorithm design on diverse platforms
- Optimization for resources (energy, bandwidth, memory hierarchy)

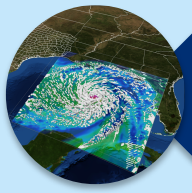


Cross-layer Approaches

- Re-thinking/re-designing the hardware and software stack
- Coordination across all layers

Scalable Distributed Architectures

- Highly scalable and parallel architectures for people and things connected everywhere
- Runtime platforms and virtualization tools

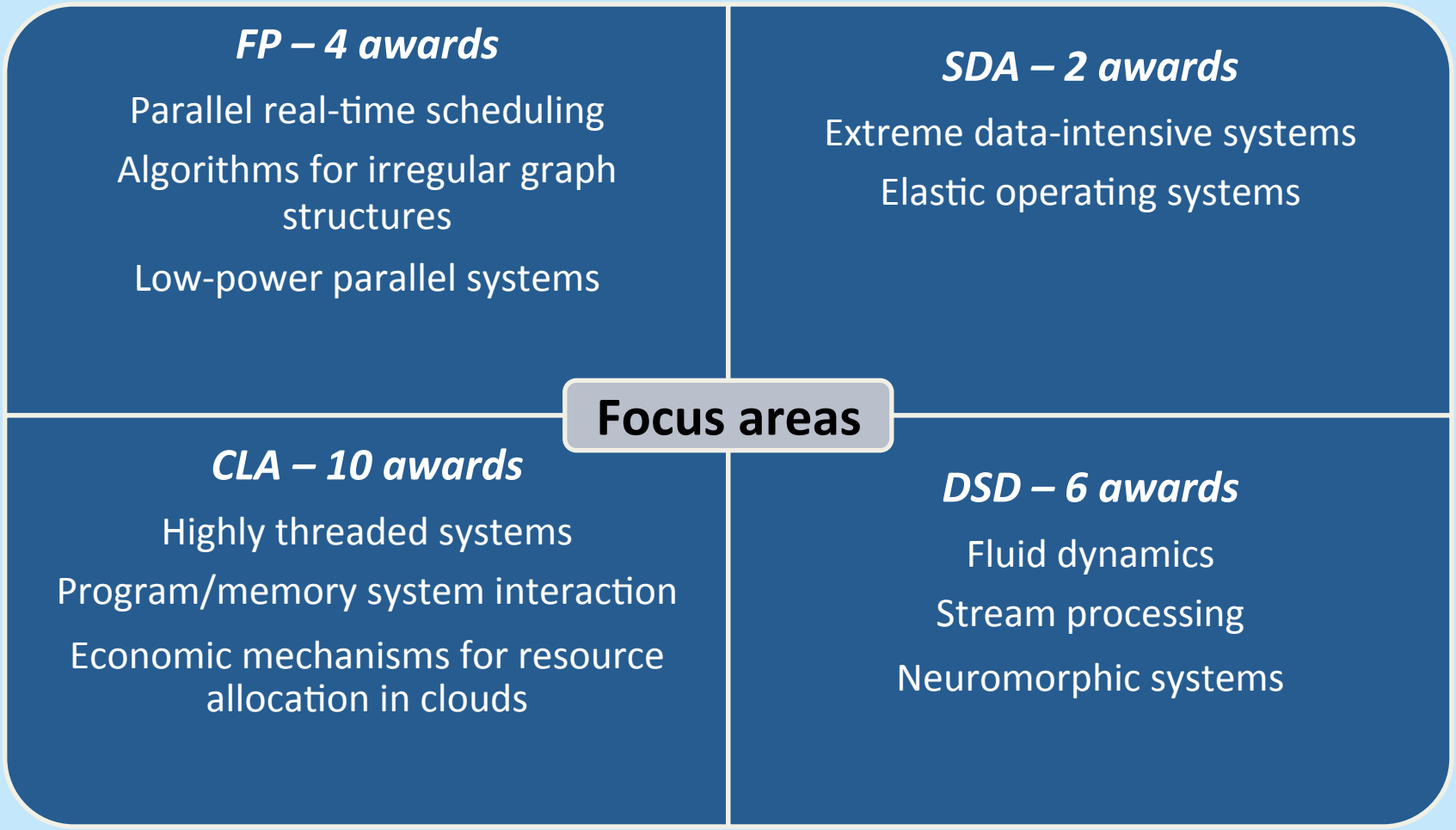


Domain-specific Design

- Exploiting domain knowledge to improve programmability and performance

Exploiting Parallelism and Scalability (XPS)

Awards in 2013



Expeditions in Computing

Exploring scientific frontiers that promise transformative innovations in computing

Beyond Moore's Law

- ***Molecular Programming Architectures, Abstractions, Algorithms and Applications,*** Caltech, Harvard, UC, San Francisco, UW, 2013
- ***Variability-aware Software for Efficient Computing with Nanoscale Devices,*** UCSD, UCLA, UIUC, Stanford, Michigan, 2010
- ***Customizable Domain-Specific Computing,*** UCLA, UCSB, Rice, Ohio State, 2009
- ***The Molecular Programming Project,*** CalTech, U Washington, 2008

Sustainability & Environment

- ***Understanding Climate Change: A Data Driven Approach,*** Minnesota, Northwestern, NC State, NC A&T State, 2010
- ***Computational Sustainability: Computational Methods for a Sustainable Environment, Economy, and Society,*** Cornell, Oregon State, Bowdoin, 2008

Wireless & Internet

- ***Open Programmable Mobile Internet 2020,*** Stanford, 2008

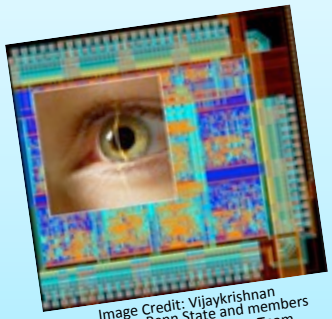


Image Credit: Vijaykrishnan Narayanan, Penn State and members of Visual Cortex on Silicon Team

Healthcare & Wellbeing

- ***Visual Cortex on Silicon***, Penn State, USC, Stanford, York College, UCSD, SCLA, Pitt, MIT, 2013
- ***Socially Assistive Robots***, Yale, USC, MIT, Stanford, Willow Garage, 2011
- ***Computational Behavioral Science: Modeling, Analysis, and Visualization of Social and Communicative Behavior,*** Georgia Tech, MIT, Boston U, UIUC, USC, ***Carnegie Mellon, 2010***

Robotics

- ***An Expedition in Computing for Compiling Printable Programmable Machines, MIT, U Penn, Harvard, 2011***
- ***RoboBees: A Convergence of Body, Brain and Colony, Harvard, Northeastern, 2009***

Image Credit: Harvard University

Limits of Computation

- ***Understanding, Coping with, and Benefiting from Intractability,*** Princeton, Rutgers, NYU, Institute for Advanced Study, 2008

Image Credit: UC San Diego Jacobs School of Engineering

Formal Modeling and Verification

- ***Expeditions in Computer Augmented Program Engineering, U Penn, UC Berkeley, UMD, Rice, Cornell, U of Michigan, U of Illinois-UC, UCLA, MIT, 2011***
- ***Next-Generation Model Checking and Abstract Interpretation with a Focus on Embedded Control and Systems Biology, Carnegie Mellon, Stony Brook, NYU, UMD, Pitt, Lehman College, JPL, 2009***

Big Data

- ***Algorithms, Machines, and People, UC Berkeley, UC San Francisco, 2011***
- ***(Understanding Climate Change: A Data Driven Approach,*** Minnesota, Northwestern, NC State, NC A&T State, 2010)

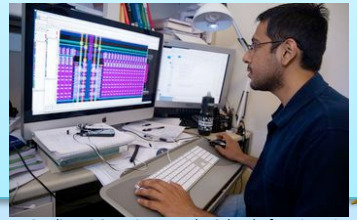


Image Credit: UC San Diego Jacobs School of Engineering

Expeditions in Computing

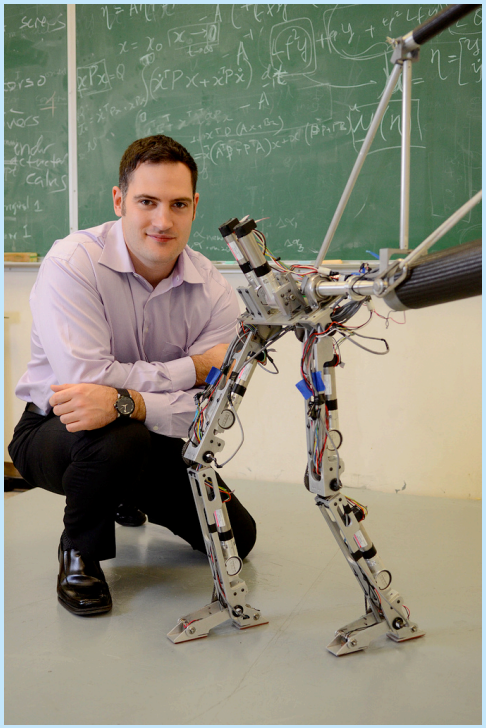
16 awards made so far (each award is for 5 years, $2M/year)

Year	Awards	Pre-projects	PI, Co-PI & SP	Institutions
2008	4	75	1000	166
2009	3	48	650	161
2010	3	23	232	76
2012	4	36	328	69
2013	2	30	328	78

Next Preliminary Proposal Due date – March 12, 2014
New solicitation is about to undergo clearance.

Frontiers

- **CPS: 2 awards in 2013**
  - **Foundations of Resilient Cyber-Physical Systems (FORCES)** - University of California, Berkeley; Massachusetts Institute of Technology; Vanderbilt University; and University of Michigan.
  - **Correct-by-Design Control Software Synthesis for Highly Dynamic Systems** - University of Michigan, University of California, Los Angeles, Texas A&M University; and Carnegie Mellon University.
- **SaTC: 5 awards in total: 2 awards in 2012; 3 in 2013**
  - **Beyond Technical Security: Developing an Empirical Basis for Socio-Economic Perspectives** - University of California, San Diego; International Computer Science Institute; and George Mason University.
  - **Privacy Tools for Sharing Research Data** - Harvard University.
  - **Enabling Trustworthy Cybersystems for Health and Wellness** - Dartmouth College; University of Illinois at Urbana-Champaign; Johns Hopkins University; and University of Michigan.
  - **Rethinking Security in the Era of Cloud Computing** - University of North Carolina at Chapel Hill; Stony Brook University; Duke University; North Carolina State University; University of Wisconsin at Madison; and RSA Labs.
  - **Towards Effective Web Privacy Notice and Choice: A Multi-disciplinary Perspective** - Carnegie Mellon University; Fordham University; and Stanford University.



Credit: Jim Lyle, TTI Communications

Credit: University of North Carolina at Chapel Hill

Discussion Item: The Future of the Expeditions and Frontiers

TODAY:
14 concurrent expeditions; 5 frontiers in cyber security; 2 frontiers in CPS

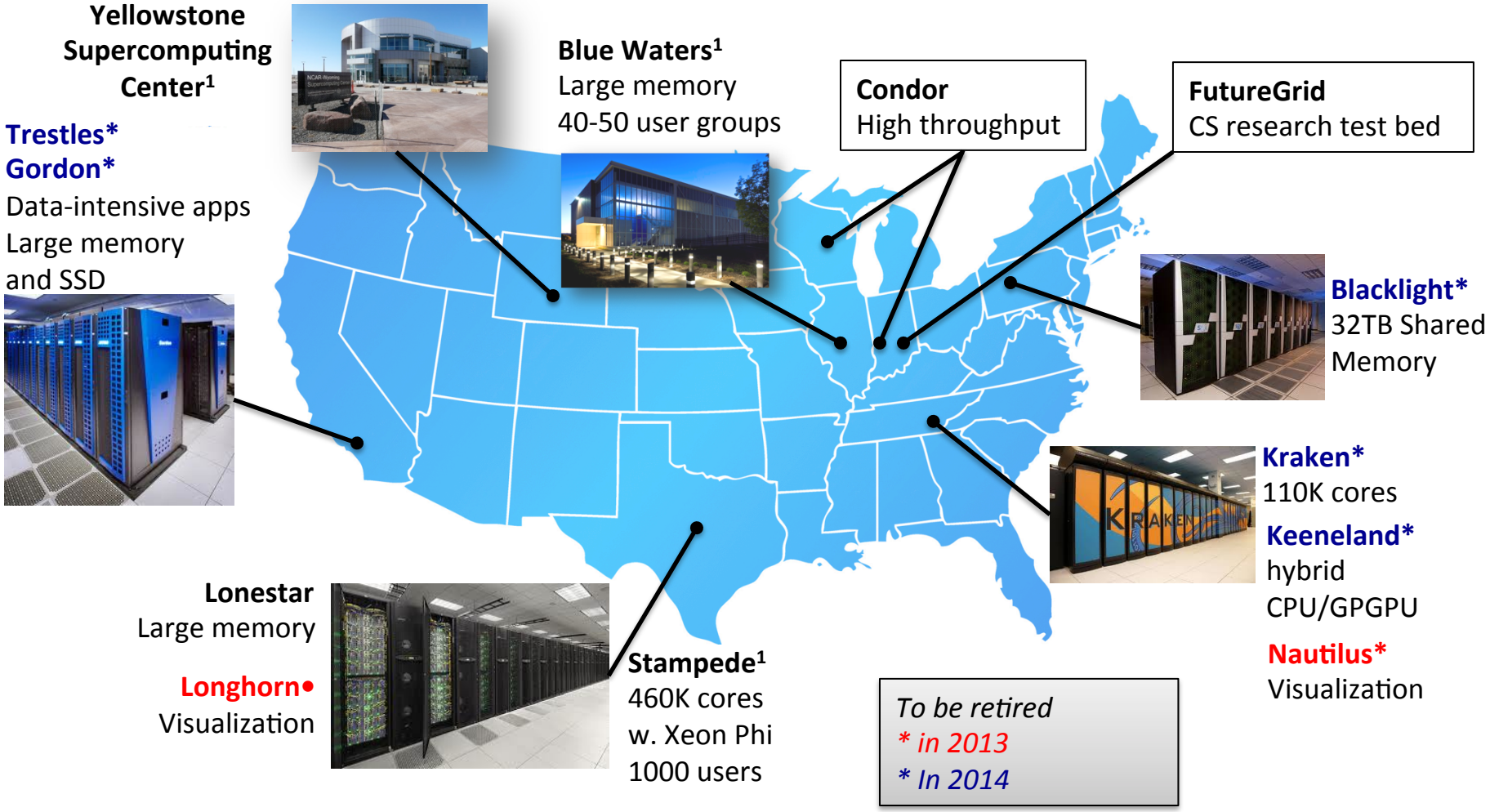
1. ***CISE portfolio balance*** *– small, medium and large-scale awards*
2. ***Project collaboration and coordination*** *– incentives and best practices*
3. ***Project self-assessment*** *– what works and what doesn't*
4. ***Program assessment*** *– ideas for improvement in NSF oversight*
5. ***Life after Expeditions*** *– follow-on programs and funding mechanisms*

New Programs and Initiatives

- Big Data Program and Initiative (NSF 12-499)
- National Robotics Initiative, NRI (NSF 12-607)
- US Ignite Initiative
- Smart and Connected Health, SCH (NSF 13-543) – now jointly with NIH
- Campus Cyberinfrastructure – Network Infrastructure and Engineering Program, CCNIE (NSF 13-530)
- CISE Research Infrastructure: Mid-Scale Infrastructure – NSFCloud (NSF 13-602)
- Data Infrastructure Building Blocks, DIBBS (NSF 14-530)
- Enhancing Access to the Radio Spectrum, EARS (NSF 14-519)
- Exploiting Parallelism and Scalability, XPS (NSF 14-516)
- Failure-Resistant Systems, jointly with SRC (NSF 12-566)
- Future Internet Architectures – Next Phase, FIA-NP (NSF 13-538)
- Secure and Trustworthy Cyberspace, SaTC (NSF 13-578)
- Secure and Trustworthy Cyberspace: Secure, Trustworthy, Assured and Resilient Semiconductors and Systems – SaTC: STARSS (NSF 14-528)
- STEM-C Partnerships: Computing Education for the 21st Century, CE21 (NSF 14-523)
- CyberSEES (NSF 14-531)
- Hazards SEES (NSF 12-610)
- CISE-MPS Interdisciplinary Faculty Program in Quantum Information Science (NSF 12-540)
- United States-Israel Collaboration in Computer Science, USICCS (NSF 12-603)
- US-Finland Wireless Innovation, WIFIUS


Activities Update

NSF Advanced Computing Infrastructure



1. Launched in FY 2013

Discussion Item: Future of HPC

OSTP-led cross-agency working group.

Reauthorization of America Competes ACT (HPC → NITRD)

CISE has sponsored a CSTB study to envision the future of HPC.

The need for a national dialogue on the future of advanced cyber infrastructure – computation, data, network, people

Computing Community Consortium Postdoc Best Practices Program

Implementation of Best Practices for Supporting Postdocs

The CCC is issuing a call for proposals to design and implement a program to support best practices for postdocs in Computer Science & Engineering.

Developing new talent to pursue and carry out high impact research is of paramount importance to the Computer Science & Engineering (CS&E) research enterprise. Postdoctoral researchers are a group that is growing in size in the CS&E research pipeline. The National Science Foundation (NSF) Computer & Information Science and Engineering (CISE) Directorate and the Computing Community Consortium (CCC) recognize the critical importance in having an excellent postdoc training experience to help junior researchers move their careers forward.

The CCC is announcing a program to develop, implement and institutionalize the implementation of best practices for strengthening the postdoc experience. The request for proposals is to award grants to institutions or consortia of institutions to design and implement a best practices program for postdocs in computer science and computing-related fields. These programs will enable PhD graduates to transition effectively to research roles in a variety of sectors.

Proposals due November 15, 2013

www.PostdocBP.org

info@PostdocBP.org

Presidential Early Career Award for Scientists and Engineers (PECASE)


Credit: Official White House Photo by Pete Souza

This award is the *highest* honor bestowed by the U.S. government on outstanding scientists and engineers in the early stages of their independent research careers. Awardees are selected annually for their pursuit of innovative research at the frontiers of science and technology and their commitment to community service as demonstrated through scientific leadership, public education, or community outreach.

Of the 102 PECASE awardees announced this year, 19 were named by NSF, and 4 were nominated by CISE

- Daniela Oliveira, Bowdoin College
- Jonathan Pillow, University of Texas at Austin
- Benjamin Recht, University of Wisconsin-Madison
- Noah Snavely, Cornell University

NSF press release: http://www.nsf.gov/news/news_summ.jsp?cntn_id=129983&org=NSF&from=news
OSTP press release: http://www.whitehouse.gov/the-press-office/2013/12/23/president-obama-honors-outstanding-early-career-scientists

2014 NSF CISE CAREER Writing Workshop

WHEN: March 31, 2014

(*Registration Deadline Feb. 21, 2014*)

WHERE: Hilton, Arlington, VA

950 N Stafford St, Arlington, VA 22203

GOAL: Introduce junior faculty to the NSF CAREER program with specific focus on CISE disciplines, and help them prepare competitive and successful CAREER proposals.

NOTE: A limited number of travel supports will be made available for HBCU/MEI faculty to attend.

WEBSITE: http://cs.gmu.edu/events/nsfcisecareer2014/

Upcoming Advisory Committee Dates

- **ACCI: April 2-3**
  - **– to overlap with MPS AC Meeting**

- **CISE AC: May 15-16**

Thanks!

fjahania@nsf.gov

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@NSF_CISE

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Midscale Infrastructure Subcommittee

Charge: Help CISE to assess how well its current mid-scale infrastructure investment meets the needs of the community and advise CISE on future directions in similar investments.

Membership

- *Jim Kurose, Co-Chair*
- *Bruce Maggs, Co-Chair*
- *Paul Barford*
- *Fran Berman*
- *Steve Corbató*
- *José Fortes*
- *Ed Lazowska*
- *Jeff Mogul*
- *Dipankar Raychaudhuri*
- *Jennifer Rexford*

CISE Vision 2025 Working Group

Charge: Help CISE to address where the field is going over the next 10-15 years and what NSF CISE should do in response.

Membership

- *David Culler, Co-Chair*
- *James Landay, Co-Chair*
- *Fran Berman*
- *Jaime Carbonell*
- *Teresa Dahlberg*
- *José Fortes*
- *Juan Gilbert*
- *Peter Lee*
- *Stefan Savage*
- *Bobby Schnabel*